Environmental Challenges and Opportunities of the Evolving North American Electricity Market
Secretariat Report to Council under Article 13 of the North American Agreement on Environmental Cooperation

8

Working Paper

Design and Legal Considerations for North American Emissions Trading

Prepared by: Douglas Russell
Global Change Strategies International

Date: June 2002

This background paper was prepared for the CEC Secretariat in support of the "Electricity and Environment" initiative undertaken pursuant to Article 13 of the North American Agreement on Environmental Cooperation. These background materials are intended to stimulate discussion and elicit comments from the public, as well as the Electricity and Environment Advisory Board, in addition to providing information for the 29–30 November 2001 Symposium on the "Environmental Challenges and Opportunities of the Evolving North American Electricity Market." The opinions, views or other information contained herein do not necessarily reflect the views of the CEC, Canada, Mexico or the United States.

Commission for Environmental Cooperation of North America
393, rue Saint-Jacques Ouest, Bureau 200
Montréal (Québec) Canada H2Y 1N9
Tel: (514) 350-4300; Fax: (514) 350-4314
E-mail: info@ccemtl.org
http://www.cec.org

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report, prepared for the Commission for Environmental Cooperation (CEC) of North America, explores key issues that should be taken into account when considering a multi-pollutant emissions trading regime that embraces all three NAFTA countries. Consideration of a NAFTA-wide emissions trading system as an environmental policy option is largely in response to the changing dynamics in the North American electricity sector, which have the potential to pose significant air quality and climate change challenges.

The report is intended to provide an understanding of the architectural elements involved in designing an emissions trading system and provides insight into which of those elements would be needed to ensure the environmental integrity of such a system. The paper also identifies potential "interface" issues that could arise under the North American Free Trade Agreement (NAFTA) in the event of the implementation of a North American emissions trading system.

The report was drafted in a two-step process. A background paper was prepared, which included: an overview of emissions trading systems in North America and results derived from these; a description of architectural elements involved in the design of an emissions trading system, and implications of cross-border harmonization of these with regard to environmental integrity and economic efficiency; and potential trade issues that could emerge by implementing a North American scheme. The background paper was circulated for comment among a wide set of environmental policy experts, comprising, for example, US EPA staff and experts on international emissions trading, and formed the basis for discussion in an informal workshop held in Toronto in December 2001.

The workshop, which brought together around 25 cross-sectoral experts in the field from all three NAFTA members, was an informal session with the objective of establishing an open dialogue. Findings and recommendations derived from the workshop were incorporated into the final draft of the report.

Experiences in Emissions Trading

Experiences in emissions trading in North America cover the gamut from voluntary credit purchasing as a way to test the market and gain trading experience, voluntary pilot programs as means to test design elements of trading systems, to a fully mature and developed emissions trading scheme exemplified by the US Acid Rain Program.

North American experience with emissions trading suggests that allowance trading (cap and trade) proves more effective than strictly open market (credit) trading in terms of both economic and environmental results.[1] Since credits are project-specific or activity-specific, they generally must be approved before they can be traded, which tends to increase transaction costs and uncertainty, and inhibits trading.

[1] While Mexico has not undertaken emission trading schemes, it should be noted that through other nontrading initiatives, the country has experienced some success in reducing the same key environmental pollutants targeted by emission trading schemes in other North American countries.

Conversely, experience has also shown that the initiation of allowance trading systems tends to be complex and politically charged. For example, the US Acid Rain Program's Phase II has 29 specific allocation methods for its 81 participants and the NO_x OTC Program has different rules for different states, such as state-specific allocation systems, which preclude some cost-saving transactions.

From a business perspective, Canadian and US experiences in trading have demonstrated that in order for firms to engage in trading they need certainty, to learn-by-doing, and they need confidence (i.e., clear policy signals).

Finally, early lessons can be taken from the incipient greenhouse gas emissions trading schemes already operating in Europe (UK and Danish systems): the fragmentation of rules (different sectors, different compliance regimes, different gases) will require significant experience in order to effect cross-border transactions.

Desirable Design Elements

There is disagreement about which overall design elements would be desirable to have in a North American emissions trading system. For example, some US firms consider hybrid emissions trading programs difficult to implement (difficulty in setting rules, high transaction costs, complex administration, etc.) and would tend towards supporting a permit trading regime. They strongly support gratis allocation of permits and inclusion of multiple gases. In terms of sectoral coverage, the notion that the more diversity the harder it is to effect transactions prevails. Banking would be an essential ingredient and some sort of penalty for noncompliance would have to be imposed. Finally, fungibility rules would need to be clear.

Conversely, other groups suggest that a NAFTA-wide system should adopt a cap, credit and trade approach, specifically since there are ample opportunities for reductions in Mexico and opportunities to foster technological innovation in uncapped sectors. Both Canada and the US have had significant experience in project-based activities (USIJI, PERT, GERT, etc.) and valuable lessons have been learned from these. However, the specificity of project requirements remains problematic. Therefore, commonalities within project-based systems[2] would require further exploration.

Many experts feel it is important to design a system with a strong institutional framework and comparable monitoring and verification procedures (trading infrastructure) that would involve standardization (firm and national level) of inventories. In exploring the scope of a NAFTA-wide emissions trading system, and looking at infrastructure costs (e.g., those involved in tracking, measuring, monitoring, verifying, etc.), it might be practical to look as broadly as possible. By setting up a broad infrastructure, costs can be reduced across the whole region (i.e., the maximum environmental benefits at the least cost). The more sectors that are involved, the larger the market and the greater the benefits from trading.

[2] A key role for governments might be to ensure that there is comparability in baselines (which raises leakage issues).

Finally, there is a need to examine if parallel efforts exist (or could be put in place) to make compatible progress in terms of environmental safeguards and trade rules. A lack of compatible approaches across the three countries could generate leakage from domestic regulatory systems. It is important to consider that NAFTA is characterized by an asymmetrical partnership. When exploring coordinated environmental policies, mechanisms or regulations, cost distribution will always be a factor. At the same time, coordinated air management efforts could provide opportunities for technological innovation (technology transfer to Mexico). In terms of GHG emissions trading, there would be a significant cost differential if Canada were bound by Kyoto rules and the US were not. In fact, in the case where Canada and Mexico were both Parties to the Kyoto Protocol and the USA remained outside, there would be little incentive for Canadian firms to purchase USA-generated credits because the rules of the Protocol explicitly state that to be valid, trading under Article 17 (International Emissions Trading) or Article 6 (Joint Implementation) can only involve Parties to the Protocol.

Potential Trade Issues under NAFTA

The report identifies a number of potential trade issues that could arise and that should be considered in the design of a NAFTA-wide emissions trading system. These include, but are not limited to the following:

- Characterization of what is being traded: classification of a tradable emissions unit (TEU) as a "good" or "service" could have different ramifications.
- Investment: does acquiring TEUs from foreign entities constitute "investment"? If it did, NAFTA Chapter 11 contains several provisions dealing with the investor state and dispute resolution.
- Subsidies and countervailing duty: allowances distributed through gratis allocation methods could be considered subsidies to industry and could, in theory, be subject to extra duty upon "importation."
- Trade in energy goods and services: are TEUs considered energy goods, services or even activities related to the procurement of energy goods and services?
- Trade restrictions: could the implementation of an emissions trading system (or associated activities) be challenged as a trade restriction?

Further Work

Some areas requiring further exploration are politically sensitive. Further work will likely depend on CEC's mandate, as it might be politically prohibitive to discuss or analyze the barriers or challenges pertaining to emissions trading programs already in existence. The following list of areas for future work is derived both from this paper and from a workshop held in Toronto in December 2001. The list is not presented in any particular order of priority.

In the context of Article 13 recommendations, it would be useful for the CEC to consider further work on:

- exploring the value of earlier model systems and studying the transactions that have already occurred and what can be learned from them;

- how to deal with integrating a non-Kyoto system with a Kyoto system (e.g., establishing a gateway);
- looking at issues involved in a larger pilot, possibly with the integration of SO_2 trading frameworks first, then NO_x and then greenhouse gas emissions trading;
- looking at how a regional trading system can spur the increased penetration of appropriate and novel technology n Mexico;
- firm level and national inventories (Mexican inventory in particular) and capacity building;
- further analysis of NAFTA trade rules and integration of environmental management among the three countries; and
- increased coordination of regional emissions trading initiatives with electricity deregulation (communication is key); in this regard, it was suggested that a discussion with, and funding support for, border area Paso del Norte Emissions Trading Working Group may be useful.

In addition, the December 2001 workshop suggested two sensitive issues that should be taken into account, and, for the time being, be avoided in future work planning. These include:

- analyzing the implications of the asymmetrical relationship within North America in terms of resource capacity, and
- taking open-ended questions to the NAFTA panel; many experts in environmental policy feel it would not be desirable to allow a trade panel to manage environmental programs.

ACKNOWLEDGEMENTS

We would like to thank Cathy Beehan and Mina Tyler for their drafting of the legal implications section of this paper. As well, thanks go to Stephanie Benkovic and Paul Miller for their insightful comments on and information provided for an earlier version of report. Special thanks to Erik Haites[3] for his thorough review and comments on Sections I and II in particular.

INTRODUCTION

For the past few years, the Commission for Environmental Cooperation (CEC) of North America has been looking at the changes in the electricity sectors of all three NAFTA countries. Largely in response to market changes, there has been a steady increase in cross-border trade in electricity. These changing dynamics have the potential to pose significant environmental challenges, in terms of air quality (NO_x, SO_x, Hg, PM, etc.) and climate change[4] (greenhouse gases).

Interest in looking at the challenges and opportunities arising from the evolving North American electricity sector was manifested as a new CEC initiative. As such, the CEC is undertaking a review of Article 13 provisions under NAFTA to examine the environmental challenges and opportunities associated with a continental approach to electricity generation and transmission. Recommendations stemming from the review will be submitted to the Council[5] in February 2002. Clearly, the proliferation of continental trade in electricity could have environmental effects and potential conflicts (competitiveness issues fostering the use of cheaper fuels; differing rules regarding the use of green power, etc.). Examining what policy tools would be effectively applied across borders and in a climate of uncertainty is critical.

A balanced and environmentally-sound approach to air management across Canada, the United States and Mexico requires the engagement of a broad range of stakeholders, including federal, provincial, state and municipal governments as well as industry and nongovernmental representatives. Given the positive experience of the US with emissions trading programs, an opportunity exists to harness the market place as a way of achieving environmental objectives cost-effectively. In fact, the use of the market to address climate change is being actively

[3] Erik Haites, in association with Fiona Mullins, recently released the paper, "Linking Domestic and Industry Greenhouse Gas Emission Trading Systems" (October 2001). It was prepared for EPRI, the International Energy Agency (IEA) and the International Emissions Trading Association (IETA) and is available at: <http://ieta.org/IETA2/Documents/New_Documents/LinkingETSystems.pdf>.

[4] The CEC began its involvement in climate change (and greenhouse gas abatement) in 1995 with JI project activities in Mexico. Since then, the CEC has been working closely with the three NAFTA governments on the issue of climate change and, for a while, focused on the potential of NAFTA-wide emissions trading. There was (still is) great uncertainty regarding the degree of readiness of the three countries to engage in emissions trading and the initiative was left aside. Interest in emissions trading was renewed with the emergence of issues in the electricity sector.

[5] The Council is composed of cabinet-level environmental officials from the three countries; the Joint Public Advisory Committee (JPAC), a group of five citizens from each country; and a Secretariat staffed with environmental experts.

explored in each NAFTA country. As well, other pollutants such as NO_x are being considered for inclusion in cross-border trading schemes. The CEC is currently exploring NAFTA-wide emissions trading options in terms of multi-pollutants. As an initial step, the CEC has been asked by the three environment ministers to look at issues surrounding the development of inventories of criteria air pollutants (including GHGs).

In November 2001, at the Seventh Conference of Parties to the UN Framework Convention on Climate Change (UN FCCC), the Parties reached agreement on the Marrakech Accords that allow for the implementation of the Kyoto Protocol. Clarity on aspects of Kyoto's first commitment period, such as Parties' unrestricted ability to use the flexibility mechanisms and operational rules for international emissions trading and the other two mechanisms, may pave the way for entry into force in the short-term. It is anticipated that Parties with greenhouse gas emissions reduction commitments will make ample use of the market mechanisms contained in the Protocol. However, these provisions will not for the foreseeable future apply to the USA, given that the current Administration has rejected the Kyoto Protocol.

For markets to operate effectively and efficiently, harmonization of the rules and procedures is desirable. There are currently a myriad of emissions trading systems for airborne pollutants being discussed or piloted in North America. All can, in some fashion, address environmental concerns stemming from a continental approach to electricity generation and transmission. As well, as design options for greenhouse gas emissions trading emerge worldwide, the opportunity exists to experiment in North America with a trading regime in which two countries could be Kyoto ratifiers[6] but only one would be legally bound to greenhouse gas emissions reductions, and the third country would not be a participant under the Kyoto Protocol.

Consideration of a North America–wide emissions trading scheme raises a number of design issues as well as several "interface" issues with the North American Free Trade Agreement (NAFTA). As a first step, this summary paper:

- provides an overview of existing emissions trading systems in North America;
- explores key issues related to a potential regime that embraces all three NAFTA countries, including identification of elements that would be needed to ensure the environmental integrity of such a system; and
- identifies potential issues that could arise under NAFTA in the event of the implementation of a North American emissions trading system.

The paper is intended to examine trading systems that include a number of gases related to air quality, as opposed to a singular focus on greenhouse gas emissions trading. The paper includes comments and issues derived from a workshop held in Toronto, December 7, 2001. The workshop brought together approximately 25 cross-sectoral experts from all three NAFTA members, in an informal session to test some of the ideas presented in this paper.

[6] Mexico has ratified the Protocol already. Canada is considering whether it will ratify in 2002. The United States has indicated it does not support the Kyoto Protocol.

Bearing in mind that trading markets *evolve* over time and that there already exists a market for emissions credits or permits, there is an opportunity to build on successful emissions trading schemes as well as learn from systems that have encountered problems. The challenges lie in designing a system with the right elements to facilitate the linkage between individual emissions trading systems; comply with the basic principles of environmental integrity and economic efficiency (market liquidity); and eliminate and/or mitigate perverse incentives (e.g., leakage).

SECTION I: OVERVIEW OF EMISSIONS TRADING IN NORTH AMERICA

Trading programs for environmental objectives were first introduced in the United States in the mid-1970s as alternatives to traditional command and control regulation[7]. Initially only applied to air pollutants, trading is now used as one of portfolio of policy tools for a wide range of issues, including: managing fisheries, reducing lead in gasoline and reducing vehicle emissions, increasing deployment of renewable energy technologies, ozone depleting substances, and water pollution.

The US first experimented with emissions trading in the mid-1970s as a way for new emission sources to set up in non-attainment areas[8] without causing air pollution to worsen[9]. The program, administered by the US EPA, compelled new sources or existing sources that wished to expand their operations to purchase credits, which represented emissions reductions (offsets) achieved by existing sources.[10] For "offsets" to be certified as credits, emissions reductions had to be: additional (beyond requirements), quantifiable, and permanent.[11]

As part of an effort to greatly reduce lead in gasoline, US EPA established a lead credit market in 1982 and expanded it in 1985. The lead phase-down program, which ended in 1987, was designed to facilitate the transition to lead-free gasoline. The program was a typical credit market: a refinery that used less lead in gasoline (grams/gallon) than required by the standard would earn credits; these credits could be traded to any other refinery. The program was successful in meeting its environmental goals.

In 1993, a market for nitrogen oxides (NO_x) and sulphur dioxide (SO_2) was established in California under the Regional Clean Air Incentives Market, or Reclaim.[12] Reclaim, a cap and trade program with declining caps in NO_x and SO_2 emissions, is administered by the South Coast Air Quality Management District (SCAQMD), a governmental agency covering Los Angeles, Orange and Riverside counties and portions of San Bernardino county. The Reclaim program is designed to meet its target emission reductions by 2003. Recently, the California Energy Commission and the South Coast Air Quality Management District presented proposals in

[7] <http://yosemite1.epa.gov/ee/epa/eermfile.nsf/vwAN/EE-0216B-07.pdf/$File/EE-0216B-07.pdf>.
[8] Areas that failed to meet standard air quality criteria set by the EPA.
[9] <http://yosemite1.epa.gov/ee/epa/eermfile.nsf/vwAN/EE-0216B-07.pdf/$File/EE-0216B-07.pdf>.
[10] The major criteria air contaminants included: carbon monoxide, lead, nitrogen oxides, sulphur oxides and volatile organic compounds.
[11] <http://yosemite1.epa.gov/ee/epa/eermfile.nsf/vwAN/EE-0216B-07.pdf/$File/EE-0216B-07.pdf>.
[12] <http://www.aqmd.gov/reclaim/reclaim.html>.

response to problems caused by the increased electricity demand during the summer of 2000. These changes included the establishment of a working group to develop rule amendments to the Reclaim program.[13]

In 1990, the US Congress announced the creation of a cap and trade program for sulphur dioxide (SO_2), as part of an overall review of the Clean Air Act. The Acid Rain Program,[14] which began in 1995, had two key features: it set ambitious SO_2 emission caps for fossil fuel–fired power plants and gave plant operators flexibility to reduce emissions by either switching to less-polluting fuels, installing devices to deal with end-of-pipe emissions, or trading allowances.[15] Other key features embodied in the Acid Rain Program included strict monitoring procedures, stiff penalties for noncompliance, and the ability to 'bank' or save surplus allowances towards future compliance periods, which acted as an incentive to cut emissions beyond the requirements.

Due, in part, to the success of the Acid Rain Program, twelve northeastern states[16] entered a program in 1994 to reduce smog-causing nitrogen oxide (NO_x) emissions, which included emissions trading as a compliance tool. Trading began in 1999, and in 2003 these states will undertake further reductions in emissions, while emissions allowances become fewer.[17]

Two other NO_x trading programs are planned in the United States to attain the goals under the Clean Air Act. Trading programs target electric power generation and involve both the EPA and the relevant state governments.. Under Section 126 of the Clean Air Act, states can petition the EPA to take action to mitigate significant transport of NO_x. Eleven states and the District of Columbia have done so and in response the EPA has established the Federal NO_x Budget Trading Program, to take effect in 2003[18]. Also, in October 1998, the EPA finalized the *Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport*

[13] Analysts have stated that the Reclaim credit trading program was a contributing factor to the recent California power crisis (summer of 2000). Record electricity demand in California during the summer of 2000 increased the demand for Reclaim credits by unprecedented rates. As a result, the price of credits increased from less than $1 per pound of NO_x (in January2000) to $50 per pound of NO_x (in August). (Note: in the compliance year 2000, power producers only accounted for $14 of total Reclaim allocations but purchased 67 percent of credits). The high prices of credits were internalized by Southern California utilities, some of which often set the price for all power purchased by the system, resulting in increases in the cost of power. In December 2000 and January 2001, the California Energy Commission and the South Coast Air Quality Management District presented proposals to address the problem, which included: the removal of electricity generators from the Reclaim system, the establishment of a fixed price for utility NO_x credits, the establishment of a traditional regulatory program for NO_x emissions, and the installation of NO_x control equipment in the short term. A working group was set up to develop rule amendments to the Reclaim program and Board hearings were tentatively scheduled for May 2001.
McCarthy, J.E. and Parker, L.B. Air Quality Issues (Reclaim): Electric Utility Restructuring Briefing Book. NCSE and NLE. <http://www.cnie.org/nle/eng-42/reclaim.html> <http://www.aqmd.gov/hb/010123a.html>.
[14] <http://www.epa.gov/AIRMARKET/arp/index.html>.
[15] Allowances (also called permits) represent the right to emit a set unit of a controlled pollutant. In this case, one allowance represents the authorization to emit one tonne of sulfur dioxide.
[16] The Ozone Transport Commission (OTC) comprises the states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Delaware, the northern counties of Virginia, and the District of Columbia. <http://www.epa.gov/airmarkets/otc/index.html>.
[17] <http://www.epa.gov/airmarkets/otc/index.html>.
[18] <http://www.epa.gov/airmarkt/fednox/index.html>.

Assessment Group Region for Purposes of Reducing Regional Transport of Ozone,"[19] which detailed specific obligations to mitigate the transport of NO_x. States required to undertake these obligations would be able to participate in a cap and trade program, with 2004 as the initial compliance year.[20]

Canadian experience with emissions credit trading programs began in Ontario with the introduction of the Pilot Emission Reduction Trading (PERT)[21] Project in 1996. PERT was a voluntary, industry-led, multi-stakeholder initiative with the objective of evaluating the feasibility of "open market" emissions trading as a mechanism to assist in the reduction of GHGs, smog and other air pollutants in the heavily industrialized corridor spanning Windsor, Ontario to Quebec City. The geographic boundary for the program was Ontario and OTC states (others were discounted for directionality). PERT provided a skeleton of rules, which evolved with experience over time. The program was transformed to Clean Air Canada Inc., which seeks to act as an advisory group to governments on SO_x, NO_x, and also greenhouse gases. Over 60 projects have been reviewed to date (issues dealt with are quite relevant to CDM/JI rules).

Another Canadian joint pilot program, the Greenhouse Gas Emission Reduction Trading (GERT)[22] Pilot, was launched in 1998. GERT represents a partnership between the Canadian federal government, a number of provinces, and industry, labour, and environmental groups and is designed to test the effectiveness of a GHG emissions credit trading program in Canada and look at ways to develop rules for the project cycle. Four projects have been evaluated to date. Since GERT's objective was setting rules, from the beginning there was a lot more consultation and analysis involved and less experience compared to the PERT program.

Recently, the government of Ontario has announced the establishment of a NO_x and SO_2 cap, credit and trade emissions trading system targeting large emitters in Ontario's electricity sector[23]. The system allows for credits to be created outside of Ontario, including international jurisdictions. As well, the use of allowances from other Canadian and foreign environmental regulatory programs would be permitted. The Ontario Emissions Trading System will take effect on 1 January 2002.[24]

---

[19] Commonly known as the NO_x SIP Call.

[20] <http://www.epa.gov/airmarkt/fednox/index.html>.

[21] <http://www.pert.org/pert.html>.

[22] <http://www.gert.org/>.

[23] <http://www.ene.gov.on.ca/envision/news/102401mb.htm>.
Through multi-stakeholder consultations prior to the announcement of this program, the Ontario Ministry of the Environment received criticisms from the US EPA. The EPA questions the compatibility of certain elements of the Ontario Emissions Trading scheme, like emissions-monitoring methods, with programs in the US like the Acid Rain Program and the OTC NO_x Budget Trading Program. Provisions and methodologies under the Ontario scheme, such as discounts on ERCs based on distance and directionality, as well as allocation of allowances to additional generators at the end of the year, specifics on credit creation, and limits in the use of ERCs and allowances, are depicted as complicated and potentially difficult to implement. Comments from B.J. McLean, Director, Clean Air Markets Division, EPA, 22 June 2001.

[24] <http://www.ene.gov.on.ca/envision/env_reg/er/documents/2001/RA01E0020-B.pdf>.

North American firms have been actively engaged in experimenting with the emerging carbon market, either through bilateral trades or as members of organizations that promote emissions trading. One of these organizations, the Chicago Climate Exchange, has thirty-seven participants for its first phase and plans to implement a voluntary pilot GHG emissions trading scheme by mid-2002.

Both the United States and Canada, as Parties to the Montreal Protocol,[25] are eligible to trade ozone depleting substance (ODS) allowances. The Montreal Protocol contains provisions that allow "industrial rationalization"[26] of ODS production and consumption rights before their complete phase-out. The overall limits on ODS production are established by the schedule specified by the Montreal Protocol, which aims to reach a "zero" limit[27]; individual limits in terms of production and consumption (import) were agreed upon for each Party, ultimately translated into limits for individual ODS producers and consumers. Although information on the volume of trades remains a commercially sensitive issue until complete phase-out, the US EPA indicates that US companies have traded 36 million kilograms of ODSs internationally between 1992 and 1995.[28]

Experiences in emissions trading in North America cover the gamut from voluntary credit purchasing as a way to test the market and gain trading experience, voluntary pilot programs as means to test design elements of trading system, to a fully mature and developed emissions trading scheme exemplified by the US Acid Rain Program.

Results Achieved and Lesson Learned

North American experience with emissions trading suggests that allowance trading proves more effective than strictly open market (credit) trading, in terms of both economic and environmental results. In particular, the United States' history of emissions trading shows the cap and trade approach under the Acid Rain Programme and Reclaim has resulted in significant program-wide cost reductions, whereas emissions credit trading has not been as successful.

Since credits are project-specific or activity-specific, they generally must be approved before they can be traded. An allowance might be comparable to a currency unit; a credit might be better compared to a specific good whose value must be determined each time through a regulatory process. Relative to allowance trading, a credit-based-only system reduces the

[25] The Montreal Protocol came into force in January 1989 with its ratification by 29 countries and the European Economic Community, which accounted for 82 percent of global ODS consumption. The overall goal of the Protocol is the complete phase-out of ODS. <http://www.unep.org/ozone/montreal.shtml>.

[26] Industrial rationalization is defined as: "the transfer of all or a portion of the calculated level of production of one party to another, for the purpose of achieving economic efficiencies or responding to anticipated shortfalls in supply as a result of plant closures." (Montreal Protocol, Article 1.8) <http://www1.oecd.org/env/docs/cc/epoc9813r1.pdf>.

[27] Schedules for phase-out of ODS controlled under the Protocol differ for industrialized countries compared to developing countries. For example, industrialized countries were to reach 0 percent of 1986 levels of CFCs by 1996, whereas developing countries would reach 0 percent of average 1995–1997 levels by 2010. <http://www1.oecd.org/env/docs/cc/epoc9813r1.pdf>.

[28] <http://www1.oecd.org/env/docs/cc/epoc9813r1.pdf>.

commodity nature of the credit, increases transaction costs and uncertainty, and potentially inhibits trading. Ensuring that a credit represents actual emissions reductions can be complex. Creating credits that do not reflect emissions reductions could compromise the environmental objectives of the system.

In concrete terms, the results of the US SO_2 cap and trade program have been positive. Power plants that participated in the first phase of the program not only reached full compliance (i.e., met all of their reductions) but they also cut an additional 30 percent beyond the original limits. Furthermore, reports indicate that costs of achieving these reductions, initially estimated to be in the range of $4–$8 billion per year, were actually closer to $1 billion.

On the other hand, experience has also shown that the initial setup and allocations for cap and trade systems tends to be politically charged.

In the New Source Review Program (where offsets can be created to achieve attainment status) states have different trading rules, which have inhibited interstate trading even within the same airshed. Similarly, the NO_x OTC Program has different rules for different states, such as state-specific allocation systems, which preclude some cost-saving transactions.

In the US, the ODS trading system helped lower the costs of implementing the Montreal Protocol, while granting producers and importers the flexibility to time their phase-out of ODSs. For example, Dow Chemical, which produced methyl chloroform in Canada and the US, shut down operations in Canada when the market declined and transferred 4.5 million kilograms of production to the United States. Dow ultimately stopped producing the chemical in 1993. The ODS trading system gave the company the flexibility to produce the chemical in the US and ship it to Canada.[29]

Pilot trading programs have also resulted in emissions reductions. For example, emissions reduction credits generated under the Ontario program PERT represent approximately fifteen million tonnes of carbon dioxide reduced from 1996 to 2000. As well, the private sector's eagerness to participate in the design phases of emissions trading schemes and undertake bilateral trades points to emissions trading as a practical means to encourage emissions reductions. Canadian and US experiences in trading have demonstrated that for firms (entities) to engage in trading they need certainty or rules, experience from learning-by-doing (through PERT, GERT, bilateral trades, etc.), and some sense of assurance that early actions on climate change will be recognized.

Early lessons will emerge from greenhouse gas emissions trading schemes beginning to operate in Europe. The UK[30] and Denmark[31] are implementing GHG emissions trading systems. The

[29] <http://www1.oecd.org/env/docs/cc/epoc9813r1.pdf>.

[30] For further information on United Kingdom's Greenhouse Gas Emissions Trading Scheme, see: <http://www.defra.gov.uk/environment/climatechange/trading/pdf/trading-summary.pdf>.

[31] Denmark's emissions trading system and legal texts: <http://www.ens.dk/uk/energy_reform/emissions_trading/index.htm>.

European Union in November 2001 released a draft legal framework for an EU-wide GHG trading system scheduled for piloting in 2005. All three systems—the UK, Danish and EU—are markedly different. This fragmentation of rules (different sectors, different compliance regimes, different gases) is likely to complicate cross-border transactions.

Summary Tables 1 and 2 provide a description of design elements for the majority of North American emissions trading systems mentioned in this Section.

Summary Table 1

Program	Geographic coverage	Sector coverage	Design	Level of aggregate cap	Allocation
US Acid Rain Program	21 eastern and mid-western US states in Phase I. Covers 48 states in Phase II.	Mandatory cap on SO_2 emissions (and NO_x reductions without cap) for fossil-fueled power plants, implemented in 2 phases.	Cap and trade. Also, voluntary opt-in program.	SO_2 cap set at 50% reduction in emissions using 1980 baseline. For NO_x, target is 2MT below 1980 levels. Both implemented in 2 phases.	Allowances grandfathered based on historic fuel consumption and specific emission rates. Small portion of allowances are auctioned yearly.
Reclaim	Los Angeles, Orange, Riverside and parts of San Bernardino counties.	Mandatory cap for SO_2 and NO_x for stationary sources emitting more than 4T annually.	Cap and trade.	Declining cap with 3 emission targets for NO_x and SO_2. By 2003, 75% reduction in NO_x and 61% reduction in SO_2.	Allowances assigned yearly based on past peak production and requirements of existing rules and control measures.
OTC	12 NE US states (CT, DE, MA, MD,ME, NH, NJ ,NY, PA, RI, VT) plus the northern counties of Virginia and Washington DC.	Mandatory NO_x cap (May to September) affecting 465 sources (utilities and industries).	Cap and trade.	Over 50% reduction in NO_x emissions by 2003 using a 1990 baseline. Two phases.	Allocation by member state.
Section 126 Federal NO_x Budget Trading Program	12 US states (DE, IN, KY, MD, MI, NC, NJ, NY, OH, PA, VA, WV) plus Washington DC.	Mandatory NO_x cap (May to September) for stationary sources.	Cap and trade.	Cap of 289 983 tonnes of NO_x.	Allocation by EPA based on historical heat input.
NO_x State Implementation Plan (SIP) Call	22 eastern US states plus Washington DC.	Mandatory NO_x cap (May to September) for large stationary sources. Participation in emissions trading program is voluntary.	Cap and trade.		Allocation by states, program administered by the EPA..

Program	Geographic coverage	Sector coverage	Design	Level of aggregate cap	Allocation
PERT	Credit users must be based on Ontario; credits can be created anywhere (directionality considerations).	Voluntary; all sources eligible to create credits. CACI database indicates 49 projects registered and reviewed (23 October 2001).	Open trading of ERCs.	Baseline for each project.	N/A
GERT	International.	Voluntary; no restrictions on sector coverage.	Open trading of emission reductions. No credits.	Baseline (Reference Case) for each project.	N/A
Ontario Emissions Trading System	Caps apply to Ontario emitters. Credits may be created outside of Ontario.	Initially 6 coal- and oil-fired OPG power stations. Additional fossil fuel–fired generators incorporated in 2004.	Cap, credit and trade system. Cap and trade for regulated group. ERCs from non-capped emitters in ON airshed. "Set-aside" that provides allowances from RE and EE projects.	Cap on NO_x reduced from 35Kt in 2002 to 27Kt in 2010; cap on SO_2 reduced from 156.5Kt in 2002 to 130Kt in 2010. "Set-aside" limited to 1Kt/yr of NO_x and 4Kt/yr of SO_2 emission allowances.	Allocated by government prior to compliance year based on their electricity production estimate for the compliance year or their past production (in proportion to estimated power produced by specific generator relative to estimate of total capped sources).
Chicago Climate Exchange	Initially 7 midwestern US states, would later expand to Canada, Mexico.	Voluntary. Commitments by companies with emissions over 250,000 tonnes CO_2 equivalents.	Cap and trade plus credits from offset projects.	Declining cap: 1% below 1999 per year; 2% below 1999 levels in 2002; 5% below 1999 levels in 2005.	Grandfathered based on 1999 emissions.

Summary Table 2

Program	Gases	Timelines	Banking	Compatibility with Kyoto Mechanisms
US Acid Rain Program	Caps on SO_2, target for NO_x	Phase I 1995; Phase II 2000.	Allowed.	None.
Reclaim	NO_x and SO_2	Est. 1993. Target reductions by 2003.	No.	None.
OTC	NO_x	Began in 1994. MOU commitments into effect 1999. Reduction commitments by	Allowed with restrictions on the use of banked allowances ("flow control").	None.

Program	Gases	Timelines	Banking	Compatibility with Kyoto Mechanisms
		2003.		
Section 126 Federal NOx Budget Trading Program	NO_x	2003 initial compliance year.		None.
NO_x State Implementation Plan (SIP) Call	NO_x	2004 initial compliance year.		None.
PERT	CO_2 and other GHGs under the Protocol, NO_x, VOCs and SO_2.	Launched in 1996. Supplanted by CACI in 2000.	Allowed. No restrictions in terms of time or quantity.	Letter of understanding with MOE ensures recognition of credits earned within future regulatory schemes.
GERT	Six GHGs under the Kyoto Protocol.	Launched in 1998. Accepting emissions reduction project activities until 31 December 2001.		MOU with government partners to ensure recognition of credits earned within future regulatory schemes.
Ontario Emissions Trading System	NO_x and SO_2	Caps take effect on January 1, 2002. Fully implemented in 2007. Large ON-wide reductions by 2010.	Allowed. ERUs valid for 7 years.	None.
Chicago Climate Exchange	All GHGs under the Kyoto Protocol.	Pilot 2002–2005	Allowed.	Yes.

NO_x: nitrogen oxides; SO_2: sulphur dioxide; CO_2: carbon dioxide; GHGs: greenhouse gases; ERC: Emission Reduction Credit; RE: renewable energy; EE: energy efficiency; CACI: Clean Air Canada Inc.

SECTION II: KEY ELEMENTS OF EMISSIONS TRADING REGIMES

The following section describes and analyses each of the key design elements of trading systems in relation to potential harmonization and draws out implications for both economic efficiency and environmental integrity.

Macro Design Options

Open, Closed or Hybrid

Every emissions trading system falls into one of three broad design categories. The most straightforward design for both ease of operation and administration is the *closed* or *cap and trade* (also called allowance or permit trading) system. A cap and trade system places emission limits on a fixed number of emission sources. Emission restrictions can be site or company-specific or can be in the form of a blanket equal reduction for all participants. Under a cap and trade system participants can then decide whether it is more cost-effective to reduce emissions internally or to purchase allowances from another participant or participants who are able to

achieve emission reductions in a more cost-effective manner. The cap and trade system illustrates the primary advantage of emissions trading—it allows the same environmental goal to be achieved at a reduced cost by allowing the most easily and economically efficient emission reductions to be undertaken.

Some observers have criticized emissions trading, making the claim that trading emissions is a means of avoiding responsibility for reducing emissions by individual emitters. Of all designs, the cap and trade system has received the least criticism and has generally been seen as an efficient means of achieving legitimate environmental goals. The environmental integrity of the system is enhanced when emissions data are closely tracked and publicly available, as in the US Acid Rain Program.

*Credit trading (*or *open)* systems differ fundamentally from allowance trading systems in that they do not generally involve a cap or limit on overall emissions. Credits are produced from emission reduction initiatives. Because credits are project-specific or activity-specific, they generally must be approved before they can be traded. As part of an effort to greatly reduce lead in gasoline, US EPA established a lead credit market in 1982 and expanded it in 1985. The program, which ended in 1987, was designed to facilitate the transition to lead-free gasoline. The program created a typical credit market: a refinery that used less lead in gasoline (grams/gallon) than required by the standard would earn credits; these credits could be traded to any other refinery.

A *hybrid design* is simply an amalgamation of both the open and closed systems. Some participants in a hybrid system would be required to take on a cap on emissions and engage in trading in order to achieve compliance. Others would also be permitted to generate and trade credits from emission reduction efforts outside of the cap. The hybrid system is the most advanced of the designs, including the largest number of participants and potentially leading to the lowest possible compliance costs. In general terms the primary drawback of the hybrid system is that it is complex; transaction costs can be high and there might be less environmental certainty than would be offered by an emissions cap alone.

Implications for harmonization: It is possible to have a closed system in one country but a hybrid system, including both cap and trade and credit trading, in another. In terms of cost savings, linking trade systems with different macro designs should increase the potential for savings. However, the ability of participants in one country to buy credits could create a competitive advantage for those participants and could raise equity issues.

Coverage

Point of Imposition

An emissions trading system could be implemented at a point "*upstream*" of final emitters by requiring the actual producer of fossil fuels to hold allowances for the potential emissions (either greenhouse gases or other atmospheric contaminants) contained in fossil fuels. The incentive to reduce emissions by the fuel producers or shippers would come from resulting changes in the

prices of fossil fuels. Advantages of an upstream system include broad coverage and administrative feasibility. Disadvantages of the upstream system would include exclusion of emissions other than those resulting from fossil fuel combustion and exclusive reliance on price incentives. Another potential drawback of the system is that it does not provide an incentive for innovation in post-combustion control technologies since the emission point source is not being regulated.

A "*downstream*" emissions trading system would require final emitters to hold allowances to cover their emissions. A downstream system offers several advantages—it may be politically more feasible than an upstream system and may provide greater incentive for technical innovation. However, practical measurement and administrative constraints mean that a downstream system would cover a smaller proportion of emissions—considerably less than half of total emissions for most countries—and would need to be complemented by other policies and measures in the remainder of the economy. Inclusion in a downstream emissions trading system is generally only practical when emissions by regulated entities can be measured or estimated with reasonable accuracy and at reasonable cost. The downstream option is typically supported by industry and conforms to more traditional points of regulation.

A *hybrid* approach can be taken with allocations combining both upstream and downstream options. For example, large industrial point sources can be allocated allowances downstream, and emissions from fuels (like emissions from the transport sector) can be captured upstream at the refinery level.

Implications for harmonization: Linking trading systems with different points of imposition (categories of sources) increases the options for emissions reductions, which would lead to increased cost savings. However, issues related to equitable treatment of comparable sources could arise when reconciling trading programs with different points of imposition.

Sector Coverage

Every emissions trading system must define its boundaries. A key aspect of a trading system's boundaries are the industrial sectors that would be required to participate in the system or given the opportunity to do so. This can be done either explicitly or implicitly by defining participation in terms of emissions levels or installed capacity.

A decision on the sectoral coverage of a system has significant implications for the efficiency of the system and the cost savings that can be derived through trading. The greater the number of participants, the greater the extent of emissions reduction opportunities that can be pursued, and the lower the cost of achieving an aggregate emission reduction target. Similarly, the greater the number of participants, the more fluid will be the operation of the market. If buyers cannot find allowances or sellers cannot find buyers, the efficiency of the system deteriorates. Although there may be very many or very few facilities within a given sector that may participate in a trading scheme, a decision on participation must consider the implications for the efficiency of the market.

A system with broader participation typically delivers greater environmental integrity. If some sectors or facilities with relatively limited but not insignificant emissions are omitted from participation within the trading system they could be left with unregulated emissions that could be allowed to increase, undermining some of the progress that would be made by firms within the trading system.

Implications for harmonization: Harmonization of sectors within a trading system on all sides of national boundaries would avoid altering the competitive positions of individual firms within the same sector. If, for example, a small Canadian petroleum refinery were omitted from participation in the trading system (as defined by the scope of its emissions) while its primary competitor—a large US-based refinery—was included in the system, such a situation could result in an undue competitive advantage for the Canadian refinery. Thus, covering the same sectors in the trading program would likely limit competitive distortions and avoid leakage to uncapped areas in a sector that might not be covered on one of the countries. In terms of environmental integrity and cost savings for participants, "broad as possible" participation would be most beneficial. The broader the program, the greater the administrative responsibilities and program infrastructure needs. Therefore, all participating countries would likely require comparable institutional capacity.

Inclusion of Sequestration (for Greenhouse Gas Trading)

The absorption or removal of greenhouse gases by sinks (sequestration) could be incorporated into a greenhouse gas emissions trading system by issuing emission credits when carbon is sequestered and requiring the acquisition of allowances when previously sequestered carbon is released to the atmosphere. Including sequestration in emissions trading raises some challenges related to the uncertainty of carbon flows and the fact that sinks may become sources of emissions in the future. Despite these challenges, sequestration is a potentially low-cost activity that can expand the trading market and enable emission targets to be met more cost-effectively.

Specific issues surrounding building sequestration into a trading system include:

- *permanence*—unlike emission reductions, removals by sinks can be lost at a later date (due to deforestation, forest fires, etc.);
- *leakage*—the potential for sequestration to simply shift deforestation and other carbon-emitting land-use practices to other locations is significant; and
- *measurability*—the measurement of carbon stocks and flows is highly complex, and analytical techniques may not provide accurate measures.

Other Design Issues[32]

Mandatory or voluntary: Participation in emissions trading could be mandatory or voluntary (encouraged by incentives). If two or more programs with different types of participation are linked, the potential for leakage is greater unless uncapped (mandatory) sources are covered

[32] These design issues are considered in *Linking Domestic and Industry Greenhouse Gas Emission Trading Systems* (October 2001) by E. Haites and F. Mullins.

under other policies. Demand for credits or emissions allowances is greater for mandatory programs than for voluntary programs; linking programs with different types of participation could exacerbate the differences in compliance costs among participants and raise equity issues.

Treatment of new sources: Decisions on how to include new sources under linked trading programs should be comparable, to avoid potential equity issues.

Gases: Trading programs can be designed to include one or several gases. Even within the context of greenhouse gas emissions trading, some Parties have chosen or are choosing to include carbon dioxide only (and only from combustion), whereas others would also include methane and nitrous oxide, for example. Since the cost of controlling pollutants varies depending on the gas, the more options available, the greater the potential for costs savings towards compliance. Linking programs that cover different gases could result in greater cost savings for participants but may lead to concerns regarding equal treatment of sources that are comparable.

Emission Targets

Allocation of Allowances

The first step in a closed emissions trading system is to establish the desired cap on emission levels and issue the corresponding emission rights so that trading can commence. The allocation or distribution of emission allowances is one of the most important and controversial aspects of an emissions trading system, with considerable consequences for wealth distribution and competitiveness.

A number of alternative means of dispersing emission rights can be undertaken, each of which has various advantages and disadvantages. The two primary means of dispersing emission rights include: (1) conducting an auction where participants in the trading system would bid for the initial emission rights and (2) an initial allocation of emission rights at no cost, based on previous emissions, which is known as “grandfathering”. Emissions can also be distributed using a combination of both approaches. If emission rights are distributed at no cost, regulators must consider what the appropriate criteria are for determining the level of the initial allocation.

Neither approach has significant implications for either the ongoing effective functioning of the market or the relative environmental integrity of a trading system. Grandfathering emission allowances is generally considered to be politically practical and administratively simple. The new greenhouse gas emissions trading system in the UK and the Lead Phase-Out program pursued in the US in the 1980s issued the emission rights through grandfathering. One drawback of this approach is that it can create a barrier for new entrants to the industries participating in the trading system because they would have to purchase 100 percent of emission rights. To overcome this potential drawback, a “new source set-aside” could be established like in the OTC NO_x trading program to provide a source of gratis allowances to new sources.

If emission rights are auctioned, the problem of discrimination against new entrants is effectively solved. Under an auction system new entrants would not be at a competitive disadvantage

because all participants in the program would have to purchase their initial emission rights. An additional advantage of conducting an auction is the opportunity to generate potentially significant amounts of revenue. However, a number of concerns arise regarding what governments would do with the revenue once received. Some have likened initial auctioning to tax grab. This approach would be potentially less popular with potential participants who would have to make significant up-front expenditures at the onset of the trading system.

Implications for harmonization: Linking programs with different allocation methods could lead to competitive disadvantages between industries. Nuances in allocation approaches (e.g., basing allocations on input or output data) would not preclude harmonization between systems; this is consistent with rules envisioned for the Kyoto flexibility mechanisms. Because of the competitiveness considerations involved, it would be advantageous for nations with strong trade ties and similar economic make-ups to select the same allocation technique. Also, different allocation methods may have implications under NAFTA since gratis allocation of allowances to a given sector could be interpreted as a subsidy (see Section III).

Absolute Caps versus Rate-based Targets

Emissions trading programs can set output or rate-based targets (i.e., emissions per unit of output or activity) or place absolute caps (limits) on total emissions for a given period. When programs with absolute caps are linked to those with rate-based targets, the potential exists for participants in a rate-based trading program to increase their output (provided they maintain below their emissions/output target) in order to generate surplus credits to make available to participants with absolute targets. Increases in output may affect the environmental integrity of the program. Restrictions in the flow of credits derived from rate-based participants could decrease this potential tendency.

Operational Rules

Monitoring Requirements

Monitoring systems are designed to allow for actual emissions to be matched with allowances (or credits), in order to assess compliance. The integrity of an emissions trading regime rests in large part on effective monitoring. Different trading schemes have used a variety approaches for monitoring emissions. For example, the US Acid Rain Program requires continuous emissions monitoring (CEM) by sources and a publicly open registry for both emissions data and allowance transactions.

The feasibility and cost of monitoring a variety of emission sources is a major determinant of the scope and structure of a domestic emissions trading system. There is a relationship between the effectiveness of monitoring and the efficiency of the trading system. The extent of the economic versus environmental integrity of monitoring systems is largely determined by monitoring technologies, which are dependant on the pollutant and the nature of specific emission sources. Accurate and consistent monitoring is necessary for both the environmental integrity of the system and the creation of market confidence.

Implications for harmonization: If different monitoring systems are used in different trading systems, then some emission allowances or credits could be deemed to be more legitimate than others. More specifically, a risk premium could be placed on allowances stemming from reductions achieved according to the less stringent monitoring system. This market differentiation undermines the efficient functioning of the market. Therefore, nations intending to trade allowances freely should require consistent emissions monitoring and verification protocols for participating sources. These protocols could vary by sector but should be as rigorous as possible.

Reporting Requirements

A reliable flow of relevant information is a natural second step of monitoring requirements. For emissions trading to function effectively, all emissions data and trades must be accurately tracked and recorded. Every participant in the domestic trading system would have an account with a central registry that recorded all emissions data and allowance transactions. Sales to foreign companies or countries would require notifying both the domestic and foreign registries, to adjust seller and buyer accounts accordingly.

Comprehensive and open reporting is essential in an emissions trading system for quality assurance and compliance and enforcement. Many successful trading programs have extensive reporting requirements. All recent emissions trading programs in the US require immediate reporting of trading activity to a government-controlled registry that is open to the public. This helps to ensure transparency and provides a compliance tool to those responsible for overseeing the program and ensuring compliance.

Implications for harmonization: Linked emissions trading programs would benefit from standardized reporting formats for the reporting of emission levels, and allowances (and credits in a hybrid system). Standardized formats would facilitate the review of data and enable comparisons across emission sources and countries, which would greatly improve the efficiency of operation and administration of the system. If two or more emissions trading systems were to be merged, it is highly probable that monitoring and reporting requirements would be among the first requirements to be harmonized. The environmental integrity of the system could be affected if participants observe emission levels biased downwards.

Credit for Early Action

Many entities are prepared to take early action to reduce emissions, but are concerned that their achievements will not be recognized under any new emissions trading system that allocates allowances based on current emissions.

Early actions to reduce emissions, in advance of the start-up of an emissions trading system, can help lower long-run costs and ease the transition to trading. A variety of options have been proposed to encourage early action. These range from an early phase-in or announcement of trading system design to programs that provide baseline protection or credit for early reductions.

The only way for early actors to get recognition before a cap is established would be within a project-based system.

A case for allowing credit for early action can be made. In addition to the argument that credit for early action rewards progressive firms and that the absence of it penalizes them relative to their competitors, it is preferable to reduce emissions sooner rather than later. The design of the early action program is important since large program design differences among countries could create competitive distortions.

Implications for harmonization: If firms in one country receive credit for early action while those in another do not, there could be potentially significant implications for competitiveness. These difficulties could be offset through different means. The country that did not allow credit for early action explicitly could do so implicitly by setting earlier base years. If the emissions cap were a reduction by a certain amount from 1990 levels, progressive firms would be able to benefit from the emission reductions that have been achieved previously. Alternatively, credit for early action could be granted through the negotiation of firm-specific emission reduction targets, rather than a blanket target for all participants. This approach would be much more difficult politically and may not supply a higher degree of environmental certainty due to the subjective nature of such negotiations

Compliance Regime

Compliance Mechanisms

Strong compliance and enforcement are necessary to ensure the proper functioning and environmental integrity of emissions trading systems. The key objective of any compliance regime is to deter participants[33] from not complying with their emission targets. Domestic and international trading schemes can use a variety of "carrots" (incentives) and "sticks" (penalties/sanctions) to prevent participants from overselling emission reductions.

A number of enforcement tools exist, ranging from moral suasion to taxes to personal liability and imprisonment. The frequency and effectiveness of domestic enforcement varies according to budgets, political will, and the types of penalties that can be legally imposed. In the US Acid Rain Program strong financial penalties well in excess of allowance prices has contributed to the 100 percent compliance rate that has been maintained under the program since its inception.

Implications for harmonization: While the harmonization of the compliance and enforcement regimes between NAFTA countries is a logical development, it is not as essential to standardize them exactly as it is to ensure that all compliance regimes are adequately effective. If one nation had a standard penalty for noncompliance of 5 percent over the price of allowances and another chose to levy a penalty of 200 percent over the price of allowances, each is sufficient to ensure compliance by profit-maximizing firms. Difficulties will only arise when compliance regimes are more starkly differentiated, such as a case in which one country relied on voluntary reporting,

[33] Individual participants (i.e., individual companies, organizations or corporations) are responsible for complying with their emission targets or caps.

corporate good will, and the fear of bad publicity to ensure compliance whereas another relied on strong financial penalties. In such a case, firms in one country could gain an economic advantage over another through noncompliance.

Liability

A related issue to compliance is that of liability. Liability relates to the consequences falling on parties involved in the transaction of illegitimate credits or as a result of overselling of some parties' allocated allowances. A number of options have been proposed, for example: the seller is liable and would pay the penalty for noncompliance; the buyer is liable and the trade would be unwound, returning the allowances to the over seller; or other hybrid options where liability is shared.

Environmental integrity is not affected by the decision to employ either buyer or seller liability as long as the overselling of allowances or illegitimacy of credits is recognized and rectified. Economic efficiency is affected by this decision, however. If buyer liability reigns, then market differentiation could develop between what are intended to be equal and standardized units, based on the reputation of the seller. Buyers may have differing levels of confidence in the legitimacy of the allowances or credits they are purchasing and, thus, have differing willingness to pay for units from different sources. The addition of risk premiums would create undue market segmentation that could undermine the efficient functioning of the market. Further, buyer liability would erode the confidence in the market because of the lack of certainty when purchasing allowances or credits, which would also undermine market efficiency, resulting in higher costs for achieving the environmental goal.

Implications for harmonization: For two or more emissions trading systems to be merged, it would be necessary to adopt a common liability rule. The existence of opposing liability rules, defined by national borders, would lead to extensive confusion, put buyer and seller motivations at odds, reduce the efficiency of the market, and ultimately undermine compliance.

Banking and Borrowing

Banking involves allowing an entity to carry forward allowances that are unused in one compliance period for use or sale in the next compliance period. Borrowing involves using allowances assigned for one compliance period in an earlier period. There has been extensive use of banking in the US Acid Rain and lead trading programs. The current US Corporate Average Fuel Efficiency (CAFE) standards allow automobile manufacturers to both bank and borrow fuel economy credits for up to three years.

The banking and borrowing of allowances offers greater flexibility in the meeting of emission targets over time, which can significantly reduce compliance costs. The inclusion of banking provisions has the potential to result in hoarding, which can lead to fewer trades, with subsequent implications for market liquidity and efficiency. For this reason, restrictions on the extent and/or duration of banking may be imposed. Similarly, if too many participants were to borrow rather than trade, market liquidity could be reduced as well.

There is general support for banking, but borrowing remains controversial because of the perceived environmental risks. Banking can have environmental benefits by providing an incentive for earlier emission reductions. Critics argue that borrowing makes it harder to check whether emission sources are in compliance with emission limits. Firms seeking short-term funds could borrow against their future allowances without being able to meet future commitments. The potential for infinite borrowing can be eliminated by instituting mandatory payback periods and/or capping the amount of borrowing allowed.

Implications for harmonization: The argument can be made that harmonization of banking and borrowing rules would be desirable for closer integration of trading systems on the grounds that the added flexibility they bring could create competitiveness advantages for those firms under the more flexible regime. This advantage is not likely to be significant in a large system. Banking and borrowing provisions do not change the nature of the commodities being traded or result in any unnecessary market segmentation.

Issues Relating to Credit Trading

Fungibility

Fungibility is defined as the degree to which emission units issued or acquired under different mechanisms will be interchangeable. Complete fungibility would imply that allowances and credits would be freely interchangeable regardless of the country, entity or project from which they originated and regardless of the identity of the buyers and sellers involved in a transaction. In this case, one tonne of NO_x credits would be of equal value to one tonne of NO_x allowances in all countries participating in a trading system at any given time.

Full fungibility is the ideal market condition. With full fungibility, transaction costs are reduced and trading could take place in a highly liquid market.

The environmental concerns surrounding the issue of fungibility are those surrounding the credit trading in general. If baselines are not accurately defined and additionality requirements not properly adhered to, then the free flow of emission credits will undermine the actual emission reductions being achieved within the system.

Implications for harmonization: Fungibility is not something that a trading system designer addresses directly in an effort to integrate trading systems; rather it is a barometer that gauges the extent of integration. If the various aspects of the trading system are adequately harmonized, then a single market with a single price for a unit of emissions will emerge.

Certification

Certification is the written assurance that a project activity has achieved emission reductions or removals as verified, and is the basis for issuing tradable emission credits. Certification is an act

of approval or authorization by a program authority or designated entity,[34] usually based on the results of a verification process.

In the absence of a certification process, the probability of credits being produced that exceed the actual emission reductions achieved or are a product of business-as-usual emission reductions increases. Therefore, certification has obvious implications for the environmental integrity of any trading system that allows credit trading.

There is an inverse relationship between the rigors of the certification process and the economic efficiency of the trading system. If the certification process is unnecessarily rigorous, then the transaction costs associated with generating the credits can rise dramatically. Transaction costs can deter investment in emission reductions that would have otherwise been economic, particularly in the case of small emission reduction projects.

Certification processes fall into the same category as monitoring and other aspects of the design of a trading system in which different approaches create different commodities. Credits that are certified will garner a higher price in the market than those that are not. Similarly, those that are certified according to a process that is, or is seen to be, more rigorous than another processes will also bring higher prices.

Implications for harmonization: The harmonization of emissions trading systems would require the standardization of certification processes as a necessary step. The failure to do so would result in a segmented market with different prices for the same amount of emission reductions.

Additionality and Baselines

Projects must achieve emission reductions that are additional to those that would have occurred in the absence of the project. The additionality requirement would be included in an attempt to ensure the environmental integrity of the trading system.

If emission reductions must be greater than what would have otherwise occurred, some estimate of just what would have otherwise occurred will be necessary. This status quo or business-as-usual measure is a baseline. A baseline provides a yardstick for calculating additionality and the subsequent Emission Reduction Units that are awarded as a result.

As was the case with additionality, there are a number of potential forms that baselines can take. Baselines can be developed on a project-by-project basis. In this case, estimates of actual change in greenhouse gas emissions (or other gases) are formulated based on narrowly defined, project-specific criteria. A broader but simple type of baseline is the sectoral baseline, in which a given project is compared against industry averages.

[34] In the case of mandatory emissions trading programs, governments are typically the governing authorities.

Procedures for baselines and the stringency of additionality criteria will need to strike a balance between minimizing transaction costs for project participants and ensuring environmental integrity.

Desirable Design Elements

There is disagreement about which up-front design elements would be desirable to have in a North American emissions trading system. For example, in designing a North American trading system, some US firms consider hybrid emissions trading programs difficult to implement (difficulty in setting rules, high transaction costs, complex administration, etc.) and would tend towards supporting a permit trading. They strongly support gratis allocation of permits and inclusion of multiple gases. In terms of sectoral coverage, the notion that the more diversity the harder it is to effect transactions prevails. Banking would be an essential ingredient and some sort of penalty for noncompliance would have to be imposed. Finally, fungibility rules would need to be clear.

Conversely, other groups suggest that a NAFTA-wide system should adopt a cap, credit and trade approach, specifically since there are ample opportunities for reductions in Mexico, and opportunities to foster technological innovation in uncapped sectors. Both Canada and the US have had significant experience in project-based activities (USIJI, PERT, GERT, etc.) and valuable lessons have been learned from these. However, the specificity of project requirements remains problematic. Therefore, commonalities within project-based systems[35] would require further exploration.

Many experts feel it is important to design a system with a strong institutional framework and comparable monitoring and verification procedures (trading infrastructure) that would involve standardization (firm and national level) of inventories. In exploring the scope of a NAFTA-wide emissions trading system, and looking at infrastructure costs (e.g., those involved in tracking, measuring, monitoring, verifying, etc.) it might be practical to look as broadly as possible. By setting up a broad infrastructure, costs can be reduced across the whole region (i.e., the maximum environmental benefits at the least cost). The more sectors that are involved the larger the market and the greater benefits from trading.

Finally, there is a need to examine if parallel efforts exist (or could be put in place) to make compatible progress in terms of environmental safeguards and trade rules. A lack of compatible approaches across the three countries could generate leakage from domestic regulatory systems. It is important to consider that NAFTA is characterized by an asymmetrical partnership. When exploring coordinated environmental policies, mechanisms or regulations, cost distribution will always be a factor. At the same time, coordinated air management efforts could provide opportunities for technological innovation (technology transfer to Mexico). In terms of GHG emissions trading, there would be a significant cost differential if Canada were bound by Kyoto rules and the US were not. In fact, in the case where Canada and Mexico were both Parties to the Kyoto Protocol and the USA remained outside, there would be little incentive for Canadian firms

[35] A key role for governments might be to ensure that there is comparability in baselines (which raises leakage issues).

to purchase USA-generated credits because the rules of the Protocol explicitly state that to be valid, trading under Article 17 (International Emissions Trading) or Article 6 (Joint Implementation) can only involve Parties to the Protocol.

SECTION III: ISSUES UNDER NAFTA

Introduction

Based on publicly available literature, this section reviews issues that could touch on NAFTA in the context of the establishment of a North American emissions trading program.

Parties engaged in multi-country emissions trading systems must also consider other international obligations. Indeed, experts in the field have recognized that international obligations under trade agreements such as the World Trade Organization (WTO) and General Agreement on Tariffs and Trade (GATT) may affect, or raise issues relating to, emissions trading. Similarly, in considering emissions trading in the context of North America, issues may arise relating to NAFTA.

Our research indicates that the impact of international trade agreements on emissions trading systems is, at this stage, speculative. A few authors have canvassed some of the possible implications of the WTO for an emissions trading system. We found nothing, however, that explicitly addressed emissions trading and NAFTA.

It is relevant and timely that during an initial policy consideration of North American emissions trading, examination be given to NAFTA and its potential implications. In addition, at this early stage of analysis, it is important to highlight and explore as many issues as possible that could arise under NAFTA. We focus on a number of issues in this report; however, we note that this is not an exhaustive list.

NAFTA governs trade in goods and services and contains provisions relating to investment, technical barriers to trade, subsidies and anti-dumping.[36] NAFTA provisions that explicitly address trade in relation to an emissions trading system are lacking. A comprehensive determination of NAFTA issues that could arise as the result of the establishment of an emissions trading system within North America will largely depend on how the system is created and the rules and regulations governing it.

NAFTA Issues

Issues that could potentially be challenged or affected under NAFTA include:

[36] If a company sells its product in a foreign market at a lower price than it would charge in its home market, the company is "dumping" the product. The WTO and NAFTA contain provisions on how countries react to dumping; they discipline anti-dumping practices. <http://www.wto.org/english/tratop_e/adp_e/adp_e.htm>.

Goods and Services

In the creation of an emissions trading program it is possible that any of a number of tradable instruments may be created, among which are:

Allowances or Permits
AAUs (Assigned Amount Units)
ERUs (Emission Reduction Units)
CERs (Certified Emission Reduction Units)
RMUs (Removal Units)
Credits
T-RECs (Tradable Renewable Energy Certificates)
TGCs (Tradable Green Certificates)

Experts in this field have referred to such allowances and credits as Tradable Emissions Units, or TEUs. The type of tradable instrument created by an emissions trading system may have differing implications for NAFTA. Given the scope of the report, and for ease of reference, we adopt the terminology "TEUs" for any and all tradable instruments, unless otherwise noted.

To determine the impact of an emissions trading program on an international trade agreement such as NAFTA, it is first necessary to determine what are TEUs (i.e., characterize what is being traded). Whether these instruments are "goods" or "services" within the meaning of NAFTA, is, in large part, a threshold-issue to be determined.

Various forms of TEUs have been referred to in papers and articles on GHG Emissions Trading as "economic instruments," "fungible economic tools," "sovereign debt" and "transactable components of sovereign obligations." They have also been compared to "quotas" used by countries in fisheries management.

According to the literature reviewed, it appears that the WTO has not directly addressed the issue of whether a TEU is a good or a service.

Investment Issue

In theory, trade in TEUs could invoke issues that would bring into effect provisions of NAFTA Chapter Eleven on investment.

Are NAFTA owners of TEUs investors for the purposes of Chapter Eleven? Or, put another way, does the acquisition of a TEU in one NAFTA Party by a private entity of another NAFTA Party amount to an "investment" under the provisions of Chapter Eleven? If so and if the domestic laws of a NAFTA country did not protect the investor's property rights in the TEUs from government expropriation (assuming that property rights exist in TEUs), could the dispute settlement provisions of Chapter 11, Section B be invoked? The rules established to regulate trade in TEUs should, therefore, take into account the investment provisions of NAFTA.

Furthermore, Article 1114[37] of Chapter Eleven makes reference to provisions to "ensure that investment activity in its territory is undertaken in a manner sensitive to environmental concerns."

What are the implications, if any, of this article in relation to trades conducted under an emissions trading system?

Subsidies (Countervail)

Under NAFTA Article 1902, Parties have the right to charge extra duty on subsidized imports from any other Party if they are found to be adversely affecting domestic producers.

If the rules governing allocation of allowances or permits create the possibility of a subsidy to a specific industry[38], then NAFTA provisions relating to subsidies may apply.

Anti-Dumping

It may be more difficult to address the impact of a North American emissions trading program on anti-dumping issues relating to the goods produced by the industries using the TEUs. The drafters of the program would need to consider the cost of production of goods by industries participating in the emissions trading system to avoid skewing of potential dumping margins.

Trade in Energy Goods and Services

NAFTA Chapter Six (Energy and Basic Petrochemicals) directly relates to trade in energy goods and services. The chapter applies to measures relating to energy goods and to measures relating to investment and cross-border trade in services associated with such goods. Goods are classified as energy goods if they appear under certain headings of the Harmonized System.

Our review of the literature indicates that TEUs are not classified under the Harmonized System. Therefore, are TEUs goods or services to which the provisions of Chapter Six apply?

It should also be noted that Article 602.3 states: "Except as specified in Annex 602.3, energy and petrochemical goods *and activities* shall be governed by the provisions of this Agreement" (emphasis added). If TEUs are not a good nor service for the purposes of Chapter Six, are the creation of and trade in TEUs an *activity* that would bring into effect the provisions of this chapter?

---

[37] Article 1114 of Chapter Eleven states:

> Nothing in this chapter shall be construed to prevent a Party from adopting, maintaining or enforcing any measure otherwise consistent with this Chapter that it considers appropriate to ensure that investment activity in its territory is undertaken in a manner sensitive to environmental concerns.

[38] For example, if one country decides to allocate allowances to X industry by grandfathering, whereas another country allocates allowances through auctions to the same industry, then the gratis allocation of the former may be construed as a subsidy.

Article 603 states that subject to the further rights and obligations of this Agreement, the Parties incorporate the provisions of GATT, with respect to prohibitions or restrictions on trade in energy. A review of these GATT provisions would have to be undertaken to determine the implications for a North American emissions trading system.

There are also detailed provisions in Annex 602.3 dealing with Mexico and its energy sector that should be considered.

Permissible Exceptions to NAFTA

Exceptions to NAFTA are found in Chapter Twenty-One, which incorporates certain provisions under GATT (Article XX) and references environmental measures necessary to protect human, animal or plant life or health. Could any issues arise as a result of the incorporation of GATT Article XX?

In designing a North American emissions trading system, it should be noted that Article 2101.2[39] states that stipulations under Trade in Goods, Technical Barriers to Trade and Cross-Border Trade in Services would not prevent NAFTA Parties from enforcing measures to ensure compliance with laws or regulations, provided these measures are not applied in a way that would discriminate arbitrarily between countries or constitute a veiled attempt to restrict trade between the Parties.

Further consideration of and research into what are the implications of this Article, if any, for the establishment of a North American emissions trading system need to be undertaken.

Trade Restrictions

It is important to note that Article 3.5 of the UNFCCC provides in part that:

> …Measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.

[39] Article 2102.2:

> Provided that such measures are not applied in a manner that would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail or a disguised restriction on trade between the Parties, nothing in:
>
> Part Two (Trade in Goods), to the extent that a provision of that Part applies to services,
>
> Part Three (Technical Barriers to Trade), to the extent that a provision of that Part applies to services,
>
> Chapter Twelve (Cross-Border Trade in Services), …
>
> Shall be construed to prevent the adoption or enforcement by any Party of measures necessary to secure compliance with laws or regulations that are not inconsistent with the provisions of this Agreement…

This statement implies that a trade restriction not permitted under international trade agreements such as NAFTA could arise under an emissions trading system. The drafters of such a system need to recognize provisions in NAFTA that could give rise to allegations of trade restrictions or trade barriers.

NAFTA Chapter Nine deals with technical barriers to trade.[40] In general, Chapter Nine applies to standards-related measures that may affect trade in goods or services between NAFTA Parties. Under Article 904 and in accordance with the Agreement, Parties are permitted to adopt any standards-related measure[41] relating to the protection of human, animal or plant life or health, the environment, or consumers, and any measure to ensure its enforcement or implementation.

The question of whether any rule or regulation established under an emissions trading system would fall within the meaning of standards-related measures needs to be explored. If determined that Chapter Nine could apply, the drafters of an emissions trading system would need to take into consideration the provisions of this Chapter.

Summary on NAFTA Trade Implications

Several issues that could potentially arise under NAFTA related to North America–wide emissions trading have been identified but are speculative, at best. As proposed international emissions trading systems develop and cross-border trading is initiated (e.g., the EU greenhouse gas emissions trading scheme scheduled to begin in 2005), experience will identify true conflicts between multilateral environmental policies and trade agreements. Some issues identified in this report include the following:

- Characterization of what is being traded: classification of a TEU as a "good" or "service" could have different ramifications.
- Investment: does acquiring TEUs from foreign entities constitute "investment"? If it did, NAFTA Chapter 11 contains several provisions dealing with the investor state and dispute resolution.
- Subsidies and countervailing duty: allowances distributed through gratis allocation methods could be considered subsidies to industry and could, in theory, be subject to extra duty upon "importation."

[40] Article 903 states:

> Further to Article 103 (Relation to Other Agreement), the Parties affirm with respect to each other their existing rights and obligations relating to standards-related measures under the GATT Agreement on Technical Barriers to Trade and all other international agreements, including environmental and conservation agreements, to which those Parties are party.

[41] Standards-related measure is defined in Article 915 as "a standard, technical regulation or conformity assessment procedure." Technical regulation is defined as "a document which lays down goods' characteristics or their related processes and production methods, or services' characteristics or their related operation methods, including the applicable administrative provisions, with which compliance is mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a good, process, or production or operation method".

- Trade in energy goods and services: are TEUs considered energy goods, services or even activities related to the procurement of energy goods and services?
- Trade restrictions: could the implementation of an emissions trading system (or associated activities) be challenged as a trade restriction, for example?

Under domestic trade law, parties to the Kyoto Protocol could choose to recognize extra-Kyoto currencies for domestic compliance but would still have to have enough Kyoto-sanctioned credits/AAUs (AAUs, CERs, RMUs, ERUs) to meet their target. Therefore, NAFTA countries could establish a new system with their own currency and Kyoto parties could decide to recognize the NAFTA currency for domestic compliance. However, it is difficult to envision a market for extra-Kyoto currencies.

References for Section III

Aslam, M.A., Cozijnsen, J., Morozova, S., Stuart, M., Stewart, R.B., and Sands, P. *Greenhouse Gas Market Perspectives: Trade and Investment Implications of the Climate Change Regime.* UNCTAD, 2001.

Parker, R. *Designs for Domestic Carbon Emissions Trading: Comments on WTO Aspects*. Heinz Center for Science, Economics and the Environment, 1998.

Petsonk, A. *The Kyoto Protocol and the WTO: Integrating Greenhouse Gas Emissions Allowance Trading into the Global Marketplace*. Duke Environmental Law and Policy Forum, 1999.

Werksman, J. *WTO Issues Raised by the Design of an EC Emissions Trading System*. FIELD, 1999.

AREAS FOR FURTHER EXPLORATION

Some areas requiring further exploration are politically sensitive. Further work will likely depend on the CEC's mandate, as it might be politically prohibitive to discuss or analyze the barriers or challenges from emissions trading programs already in existence. The following list of areas for future work is derived both from this paper and from a workshop held in Toronto in December 2001. The list is not presented in any particular order of priority.

In the context of Article 13 recommendations, it would be useful for the CEC to consider further work on the following:

- Exploring the value of earlier model systems and study of transactions that have already occurred and what can be learned from that.
- How to deal with integrating a non-Kyoto system with a Kyoto system (e.g., establishing a gateway).
- Looking at issues involved in a larger pilot, possibly with the integration of SO_2 trading frameworks first, then NO_x and then greenhouse gas emissions trading.

- Looking at how a regional trading system can spur the increased penetration of appropriate and novel technology in Mexico.
- Firm level and national inventories (Mexican inventory in particular) and capacity building.
- Further analysis of NAFTA trade rules and integration of environmental management for the three countries.
- Increased coordination of regional emissions trading initiatives with electricity deregulation (communication is key). In this regard, it was suggested that a discussion with, and funding support for, border area Paso del Norte Emissions Trading Working Group may be useful.

In addition, the December 2001 workshop suggested a number of "red flag" issues which should be taken into account in future work considerations. These include:

- analyzing the implications of the asymmetrical relationship within North America in terms of resource capacity, and
- taking open-ended questions to the NAFTA panel; many experts in environmental policy feel it would not be desirable to allow a trade panel to manage environmental programs.

ANNEX: SUMMARIES OF EMISSIONS TRADING REGIMES

The US Acid Rain Program

The 1990 Clean Air Act Amendments[42] gave rise to the US Acid Rain Program, which targets the electricity sector, with the overall objective of reducing sulphur dioxide (SO_2) and nitrogen oxides (NO_x), the primary causes of acid rain.

Rather than relying on command-and-control, it set a strict SO_2 cap for power plants and, in return, provided them with unprecedented flexibility in meeting that cap. An SO_2 emissions trading system was established to give plant operators the flexibility to choose the most cost-effective means to reduce emissions.

In Phase I, which began in January 1995, the largest, highest emitting electric utility generating units were required to reduce emissions.[43] In Phase II, which began in 2000, virtually all electric utility units were required to reduce their emissions to roughly one-half of 1980 levels. Under the program, sources are required to hold allowances equal to each year's emissions.

The Acid Rain NO_x program was also implemented in two phases, beginning in 1996 and 2000, and comprises many of the same principles of the SO_2 program; however, it does not cap emissions, nor does it include an allowance trading system.

Reclaim

In 1993, the Regional Clean Air Incentives Market (Reclaim) was established.[44] Under Reclaim, a market for NO_x and a market for SO_2 have been created. The program is administered by the South Coast Air Quality Management District (SCAQMD), a governmental agency covering Los Angeles, Orange and Riverside counties and portions of San Bernardino county. Under the declining cap, these sources have been assigned three emissions targets for NO_x and SO_2, which included an initial allocation in 1994, the mid-point reduction in 2000, and ending allocations in 2003.

OTC NO_x

The Clean Air Act Amendments of 1990 set National Ambient Air Quality Standards (NAAQS) for ground-level ozone that must be met by states across the country. In the Clean Air Act, Congress also established the Ozone Transport Commission (OTC),[45] a working group made up of twelve Northeast states[46] and the District of Columbia, to assist states in the Eastern US to

[42] Title IV of the Clean Air Act
[43] The IV Clean Air Act established a cap on SO_2 emissions (10 million tonnes below 1980 levels) affecting power plants in 21 eastern and mid-western US states. <http://www.epa.gov/airmarkets/arp/overview.html>
[44] <http://www.aqmd.gov/reclaim/reclaim.html>
[45] <http://www.epa.gov/airmarkets/otc/index.html>
[46] Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Delaware, the northern counties of Virginia.

meet these targets. The OTC created a NO_x Budget Program to help reduce regional ozone levels. The OTC's efforts included the September 1994 signing of a memorandum of understanding with the EPA.. The agreement, signed by all OTC states except Virginia, put in place a cap and trade system with boundaries reflecting the regional nature of the problem.

The OTC agreement caps NO_x emissions at 219,000 tonnes during the compliance period for the years 1999–2000 and 143,000 tonnes starting with the compliance period in 2003. The caps represent less than half the 1990 baseline of 490,000 tonnes and extend to 465 sources of NO_x in participating OTC states, including utilities, independent power producers, and industrial facilities. The compliance period for the program runs from May through September, corresponding to the seasonal nature of the ground-level ozone problem.

Section 126 Federal NO_x Budget Trading Program

Under Section 126 of the Clean Air Act, states may petition EPA to take action to mitigate significant transport of NO_x, one of the main precursors of ozone. Eleven states (CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, and VT) and the District of Columbia have petitioned EPA to find that certain major stationary sources in upwind states emit NO_x emissions in violation of the CAA's prohibition on amounts of emissions that contribute significantly to ozone non-attainment or maintenance problems in the petitioning state.

In May 1999, EPA established the Federal NO_x Budget Trading Program[47] as the general control remedy for sources that will be subject to any future finding under section 126 petitions. On December 17, 1999 EPA finalized findings under the original eight petitions (CT, MA, ME, NH, NY, PA, RI and VT) and the details of the Federal NO_x Budget Trading Program, including unit allocations, for sources affected by the original eight petitions. EPA also expects to propose action on the petitions from DC, DE, MD and NJ in the near future.

The overall emissions cap for 2003 is 289,980 tonnes of NO_x and extends to major stationary emitters. The compliance period runs from May through September. The program is owned and administered by the EPA.

NO_x State Implementation Plan (SIP) Call

In October 1998, EPA finalized the *Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone*. (Commonly called the NO_x SIP Call.[48]) The NO_x SIP call was designed to mitigate significant transport of NO_x, one of the precursors of ozone. For those states opting to meet the obligations of the NO_x SIP call through a cap and trade program, EPA included a model NO_x Budget Trading Program rule (Part 96). This trading program was developed to facilitate cost-effective emissions reductions of oxides of nitrogen (NO_x) from large stationary sources. Part 96 provides sources with a complete trading program, including provisions for applicability, allocations, monitoring, banking, penalties, trading protocols and

[47] <http://www.epa.gov/airmarkt/fednox/index.html> <http://www.epa.gov/airmarkt/fednox/126secg.pdf>
[48] <http://www.epa.gov/airmarkt/fednox/index.html>

program administration. States choosing to particpate in the NO_x Budget Trading Program have the flexibility to modify certain provisions within the model rule.

As part of its responsibility to administer the NO_x Budget Trading Program under the SIP Call, the Clean Air Markets Division (of the EPA) will record allowance allocations in the NO_x Allowance Tracking System (NATS) according to the specifications of each state. The requirements for recording allocations in NATS are that the state finalize its SIP, including its trading rules, the SIP be approved by EPA, and that the state submit to the Clean Air Markets Division an electronic file including account-specific allocation amounts.

The compliance period runs from May to September and the initial compliance year is 2004. The states have the option of participating in the trading program and establishing unit allocations. The program is administered by the EPA.

Pilot Emission Reduction Trading (PERT)

Established in 1996, Ontario's Pilot Emission Reduction Trading (PERT)[49] Project is an industry-led, multi-stakeholder initiative. The objective of the PERT program was to evaluate emissions trading as a tool to assist in the reduction of GHGs, smog and other air pollutants in the heavily industrialized corridor spanning Windsor, Ontario, to Quebec City.[50]

Forty-two applications for emission reduction credits were reviewed and registered during the course of the pilot project, which represents a total of 46,000 tonnes of ozone NO_x, 38,000 tonnes of non-ozone NO_x, 10,000 tonnes of SO_2, 29 tonnes of VOC, and 14,615,000 tonnes of CO_2. In 2000, PERT was supplanted by Clean Air Canada Inc.(CACI), a federally incorporated non-profit organization formed by the original private-sector members in PERT, to continue and expand on the work started under the pilot. CACI sees itself as having a key role in facilitating the creation of an emissions trading market in Canada.[51]

PERT can be considered a Canadian adaptation of the "open market" trading regime successfully launched in the north east United States for smog application.[52]

Greenhouse Gas Emission Reduction Trading (GERT)

The Greenhouse Gas Emission Reduction Trading (GERT)[53] Pilot, launched in 1998 and led by the province of British Columbia, is a voluntary initiative representing a partnership between the Canadian federal government,[54] a number of provinces,[55] local governments,[56] industry, labour

[49] <http://www.pert.org/pert.html>.
[50] PERT's initial focus was on NO_x and VOC emissions but in 1997 expanded to include SO_2 and GHGs.
[51] <http://www.ene.gov.on.ca/envision/news/sp0059.htm>.
<http://www.emissions.org/publications/emissions_trader/0103/>.
[52] <http://www.nescaum.org>.
[53] <http://www.gert.org/>.
[54] Environment Canada, Natural Resources Canada

and environmental groups. GERT reviews and evaluates GHG emission reduction projects that are the subject of trades to determine if they have resulted in actual emission reductions, whether these reductions are measurable and verifiable, and if the reductions are over and above what is required by law. The GERT pilot will accept emissions reduction project activities until 31 December 2001. Eligible projects include those that have reduced emission from 1 January 1997. Four projects have been reviewed to date,[57] while fourteen project applications remain outstanding.

Ontario Emissions Trading System

In October 2001, Ontario released a draft regulation to cap nitrogen oxide (NO_x) and sulphur dioxide (SO_2) emissions from Ontario's large coal and oil-fired electricity generators operating in Lakeview, Nanticoke, Lambton, Atikokan, Thunder Bay, Lennox, which are owned by Ontario Power Generation (OPG). In 2004, coverage will extend to all generators over 25 MW who convey more than 20,000 MWh of electricity in a year to the Independent Market Operator (IMO) controlled grid, and who emit NO_x or SO_2 at more than trace levels.[58] Environmental regulations needed to be put in place before industry moved to deregulation.

The proposed regulation will ensure that NO_x and SO_2 emissions limits for the electricity sector are reduced upon the regulation coming into effect in December 2001. Emission caps will be further tightened by 2007.

As of 1 January 2002, OPG will be allowed to use emissions trading for NO_x and SO_x; however, when assets are sold, those emissions will go along with these (2004). It is a cap, credit and trade system: the program establishes a cap with a trading system for larger emitters and a credit system captures smaller non-capped sectors (e.g., land fill gas sector). By allowing non-capped sources into the market, the overall costs are reduced and there is more potential for technological innovation.

Emissions trading will be used as a tool to ensure that the installations that are capped can reduce their emissions adequately. The trading scheme also provides an incentive for sectors that are not covered under the new regulation have an incentive to reduce their emissions. The current proposal includes a "set-aside" of allowances, which has been created to provide greater incentives for energy conservation and renewable energy projects.

---

[55] BC Ministry of Energy & Mines & BC Ministry of Environment, Lands & Parks, Alberta Environment, Saskatchewan Energy & Mines, Manitoba Energy & Mines, Quebec Ministry of Natural Resources, Nova Scotia Natural Resources

[56] Greater Vancouver Regional District

[57] The most recent approved transactions took place between 1) Pacifica Papers Inc. (seller)—Powell River Pulpmill (buyer), involving fuel substitution/cogeneration, and 2) British Columbia Ministry of Environment, Lands and Parks (buyer)—Taylor Munro Energy Systems Inc (seller), arising from the installation of a solar water heating system. These reviewed transactions were announced 11 April 2001.
<http://www.gert.org/whatsnew/index.htm#010411>

[58] <http://www.ene.gov.on.ca/envision/news/102401mb.htm>

Chicago Climate Exchange

Thirty-seven major firms have indicated their intent to participate in the design phase of a voluntary pilot trading market called the Chicago Climate Exchange (CCX).[59] Based on a feasibility study funded by the Joyce Foundation, it is proposed that the pilot market would start in seven Midwest states, include emissions offset projects in Brazil, and expand over time nationally and internationally.

The design stage of the pilot trading market is expected to be complete by the end of 2001, with a total of thirty-seven companies and non-profit agencies participating in the market design phase. Participants include: Ford, DuPont, Suncor Energy, British Petroleum, STMicroelectronics, Temple-Inland, Alliant Energy, Calpine, Cinergy, NiSource, PG&E National Energy Group, Wisconsin Energy, and ZAPCO; Argiliance, the Iowa Farm Bureau and International Paper.

The CCX intends to implement a cap and trade system by mid-2002 with credits from non-capped agricultural and forestry sinks, and a limited number of credits from renewable energy projects. Greenhouse gas emissions sources from participating companies in seven Midwest states (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio and Wisconsin) will be capped based on their emissions in 1999 and companies will be issued with an equivalent amount of tradable emission allowances.

[59] <http://www.chicagoclimatex.com/html/initial.html>